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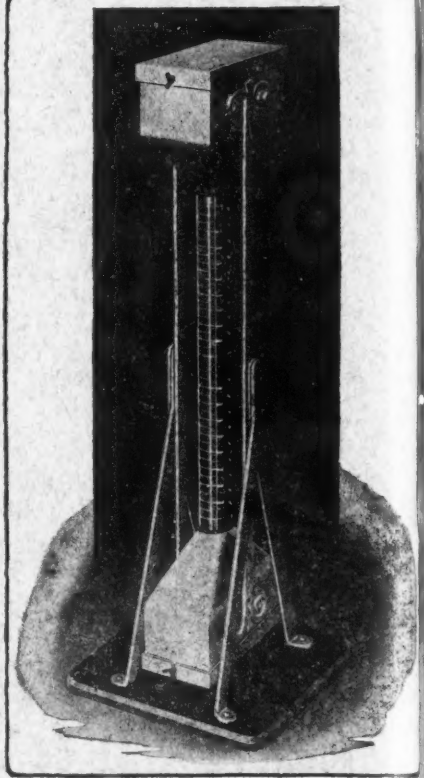

(Hour Glass Bread Measure)

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Editor ..... J. R. Hess
Associate Editor ..... A. A. Jones
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LATEST SUSTAINING MEMBERSHIP LIST

Western Canada Flour Mills Co. ..... Winnipeg, Man., Can.
Gooch Milling & Elev. Co. ..... Lincoln, Nebr.
Wichita Milling & Elv. Co. ..... Wichita Falls, Tex.
Larabee Flour Mills Corporation ..... Kansas City, Mo.
Eagle Roller Mills Co. ..... New Ulm, Minn.
Southwestern Milling Co. ..... Kansas City, Mo.
The Fleischmann Co. ..... New York, N. Y.
The Hoffman Mills Co. ..... Enterprise, Kans.
Ismert-Hincke Milling Co. ..... Kansas City, Mo.
El Reno Mill & Elev. Co. ..... El Reno, Okla.
Texas Star Milling Co. ..... Galveston, Texas
Jersey Cereal Food Co. ..... Cereal, Pa.
Campbell System, Inc. ..... Kansas City, Mo.

We want to commend you for the advanced position you are assuming in issuing the Journal. It seems to me that there is no better way in which you can give to the big millers of this country the impelling reasons for the establishment of mill laboratories. Again, in the scientific discussion of the various phases of mill work and the problems of the chemist, it gives us an opportunity for deeper study as to the construction of milling machinery.

The writer has been a teacher of chemistry for many years prior to his assuming his present position and is entirely in accord with what the chemists are attempting to teach to the big millers.—*From One of Our Advertisers.*

And say, do you like to have your letters answered? Well, the V. P. & B. M. does and he has to hand it to Hess and Jones for being on the job in this particular line. They not only answer his letters promptly but give him the specific information that he wants. This helps the work of his office very much and it certainly is appreciated. Let's all fall in line!

Mill Fumigation System successfully operated by the use of liquid hydrogen cyanide in the Hocker-Jones-Jewell Milling Co., New York. Details given in the Northwestern Miller, December 1, 1920, page 1096.

CO-OPERATION BETWEEN THE LABORATORY AND MILL

In traveling about the country, visiting flour mills from Oklahoma City to Minneapolis, it has been my privilege to talk to some owners, milling superintendents and chemists with regard to some of the problems encountered in the daily run of their work.

We are accustomed to hearing the old bromide, "Chemistry is in its infancy." But this is literally true in any industry from asphalt to zinc.

The owner of any particular industry may be a college man and yet it is almost a safe bet that he has never investigated the possibilities of chemical control or plant efficiency as related to the chemist. The war has done wonders in putting chemistry on a firmer foundation but there is a field, vast and unexplored, still to be conquered. If chemistry is in its infancy, then the traditions and practices which surround it are necessarily crude and the lines not thoroughly defined.

In the milling industry, the head miller is usually a man who has been in the flour game all his life. Before the advent of the chemist, his method of testing flour was by use of the five senses. He resented any intrusion of his domain and made it as unpleasant as possible for the young fellow of the new-fangled ideas whom they called a chemist.

A great deal of criticism has been made of the chemist. Some justified, much not merited.

The owner, if a college man, has only taken chemistry because it was necessary in order to get a degree. The practical miller, in most cases, is not in sympathy with the movement in any way. The owner, or manager representing the moneyed interests, is often at fault in the selection of the man to fill the chemist's job. Upon deciding that a certain mill is to have a chemist, the question is often, "How cheaply can I get such a man?" Cheap laboratory labor, like a poor balance, is a bad buy. To hire a near-chemist gets the plant off on the wrong foot, because, in most instances, he is not able to deliver the goods; consequently chemistry and the value of the laboratory to the industry is not properly demonstrated. The more foundation a man has, the more able he should be to make himself valued with regard to plant efficiency.

Many chemists coming into a new laboratory, confine themselves wholly to routine tests. This is decidedly a mistake. Because a man has a sheepskin from college, it does not mean that he will be an assured success in his laboratory career.

As to the status of the chemist and how he may better serve his employer. Up to the present time, the chemist has been regarded as a sort of glorified kitchen help; and, in many instances, is there because someone else has a chemist, or for an advertising purpose, or some such other superficial reason. He is put into a cubby hole and told to go ahead and demonstrate the value of the plant according to his own capabilities, his schooling, practical experience, etc. He works his way into larger quarters and a better position or out into the free air according to his own ability or limitations.

A chemist is, by nature and training, honest and to fake a result is, in his eyes, a crime. In his attitude toward the business world at large, he is more liable to under-state a proposition than to give himself the benefit of an honest doubt. The laboratory man is liable to regard life in general from the 1/20 milligram attitude; and this is wrong as far as arguing for the larger possibilities of the chemist. Cultivate the friendships of the men who visit your mills and

laboratories. Don't be too busy to listen to what some worth-while visitors have to say; and make an opportunity to visit other mills in your vicinity.

Industry just now is separating laboratory help in three divisions; the routine man in the first division; the research man in the second division; the third and most important division, the man who is coming to be known as the business man chemist.

This last division, in my mind, presents great opportunities, for the chemist who grasps them, to also become a business man; for it certainly follows that a man who is well rounded—has a knowledge of general business conditions and the training and skill of the chemist—is destined to become the plant manager, superintendent, etc., in our various industries in the future.

Just a few suggestions as to where the chemist may be of service in the cereal industry.

Investigate the manner in which your coal or fuel oil is being purchased. Find out the cost of your coal and the method of its purchase. Investigate the situation in the same manner in regard to your fuel oil. Find out whether you are buying fuel by shell-car capacity or otherwise. With a small investment and a few evenings of study you can actually show your employer where he stands on the question of heat units with regard to the fuel he is purchasing. Undoubtedly a large proportion is being wasted due to improper combustion. With a $25 piece of apparatus installed in your engine room, you can actually check up from day to day with regard to losses and waste on combustion.

How about the purchase of bags? Have you interested yourself in the problems of fillers that are usually in flour sacks? It is quite possible to pad a bag with china clay and make it appear a heavy bag.

Perhaps in your plant employing ten or twenty delivery trucks, your drivers are dumping a gallon or two of lubricating oil every evening, which might be cleaned and reclaimed, as it is only dirty and its lubricating life is not expended.

Some of you are connected with outfits that have five or six plants and all sorts of supplies are being bought continuously. Investigate the method of purchase; look into the type of materials that are being contracted for in large quantities, of any nature whatsoever.

Get acquainted with the heads of every unit of your organization. If necessary, go into the home of your head miller; make friends with him; learn what his interests are. It may be hard at first and you may find him antagonistic; but you will find that any time spent in missionary work of this kind will bring splendid results later.

Tact and diplomacy become valuable tools in the hands of the skilled worker. The chemist should interest himself in other departments of his product—buying, manufacturing and selling. Investigate the methods under which wheat and supplies are getting full value for every dollar expended. Assist in the manufacture of your product and make laboratory control of real worth to your outfit. Investigate your methods of selling and find where your flour is giving trouble and apply first aid. Install an "Ask Me" department and be ready, at all times, to assist your sales force in questions which arise with regard to your product going bad. Consider yourself a trouble shooter and always be ready to jump on a train and go out and help a dissatisifed customer.

All of this needs the full co-operation of mill superintendents and own-

ers and if you do your part and plug along hard, sooner or later you will come into the bright light of understanding and chemistry and the chemist shall take their rightful places in the industry.

F. A. ANDERSON.

THE A. A. C. C. STAMP OF APPROVAL

The stamp of approval adopted by the A. A. C. C. at the May, 1920, meeting was devised in line with our policy of uniform methods for the purpose of informing others that the analyses with which the stamp is applied were made by the standard methods adopted and employed by all members of the American Association of Cereal Chemists. This procedure was adopted to put an end to the controversy over the variation in results which have been attributed to the many different methods which have heretofore been used in analytical work. The stamp should in no case be used where A. A. C. C. methods are not employed in all determinations.

THE PROTEOCLASTIC ENZYMES IN FLOUR AND ACTION OF ENZYMES IN BREAD MAKING

The beneficial effect of age on wheat and flour have led to much speculation and widely diversified work by the cereal chemist. But without as yet having produced any, or at least very little, data of value to the chemist or to the milling industry at large.

In this article the writers have taken the subject of the Proteoclastic Enzymes in flour, in an endeaver to show what effect they might have on wheat in storage, and the effect on the decomposition of gluten both in the flour and in the dough.

Any work of this nature requires a vast amount of routine and no little time. Consequently in this paper we are giving only a small approach to what might be done on this subject, taking it from its various angles and possibilities.

Early in 1919 extensive work was carried on with the idea of establishing the presence of proteoclastic enzymes in flour and if possible to determine their working characteristics, such as media, substrate, working temperature, etc. Gluten being the protein in question, it was first chosen as a substrate. A quantity of gluten was washed from a straight grade flour. One portion was dried at 100 degrees, finely ground and extracted with ether. Another sample was autoclaved at 120 degrees for one hour, dried, finely ground and extracted with ether as above.

A flour extract was prepared in the usual manner, i. e., 10 grams of flour in 250 cc. distilled water, at 40 degrees for four hours. After filtration 25 cc. of this solution was allowed to act on 10 grams of the prepared gluten. The volume being made up to 250 cc. and a small quantity of toluol added. After twenty-four hours an aliquot of 25 cc. was taken, filtered, and the nitrogen determined on the same. The digest was then

returned to the thermostat and the same procedure followed every twenty-four hours for a period of several days. Different grades of flour were tried on this substrate, including a sample of malted flour. The results were not concordant and showed very little increase in nitrogen content. Gelatin, egg white, gliadin, zein were used in like manner as a substrate. Toluol was added about 3 cc. per liter to prevent bacterial action. As with gluten, the results were not concordant and did not show any degree of digestion. In case of the soluble proteins used as substrates, the degree of digestion was determined by the amounts of amino acids formed. As later work has proven, the amount of toluol used in the above digestions inhibit to a great extent enzymic action. And we could not say positively that a flour extract will not digest these substrates. The above digests were carried on in acid, alkaline and neutral solution, showing very little difference in results. The data being unsatisfactory, it was not tabulated here.

The foregoing methods being unsatisfactory, it was deemed advisable to trace the course of digestion of different flours in suspended solution. These digests were carried on in acid, alkaline and neutral solutions as shown in tables, using cresol and toluol to inhibit bacterial action. A temperature of 37½ degrees was used throughout.

EXPERIMENTAL MANIPULATION.

40 grams of flour was placed in a one liter erlenmeyer flask and made up to one liter with neutral distilled water. 1 cc. of cresol was added. The flask was tightly stoppered and agitated to insure homogenity and placed in a thermostat at 37½ degrees. After twenty-four hours the solution was filtered through asbestos on a Buchner funnel. Aliquots were taken out for analysis and the remainder of filtrate replaced in original flask and returned to thermostat. At intervals of five to seven days this procedure was carried on again over a period of three or four weeks.

On an aliquot of 25 cc. the nitrogen was determined and tabulated as soluble nitrogen in mgs. nitrogen.

Another 25 cc. aliquot was placed in a 400 cc. beaker, acidified with 2 cc. 1: 4 sulphuric acid. 25 cc. of a saturated solution of zinc sulphate was added, and enough zinc sulphate crystals added to saturate the whole solution. This solution was set in a thermostat over night at 37½ degrees. The precipitate was collected on a nitrogen free filter paper, washed with a saturated solution of zinc sulphate, transferred to a Kjeldahl flask and the nitrogen determined in the usual manner. This fraction includes the albuminoses and is tabulated as proteos, in mgs. nitrogen.

By precipitation with different concentrations of zinc sulphate four different albuminoses could be obtained, and it would be interesting to note which form showed the greatest amount of cleavage to form peptone products. However this was not done, as it would take much work and time to make the fractionations.

The fraction in the proteos filtrate not precipitated by acidulated zinc sulfate bears the name of peptone. This important fraction gives the Biuret reaction and is composed of complex derivatives of the albuminods. Further it precipitates with phosphotungstic acid, although precipitation is not complete. In the precipitated portions are found fractions giving Biuret reaction. They are considered to be composed of diamino and complex monoamino acids. In the portion still remaining in solution we have still higher polypeptides not giving the Biuret reaction ,and only in part titratable by the formaldehyde method.

To the proteos filtrate was added 10 cc. of a strongly acidulated solu-

tion of phosphotungstic acid. This was allowed to stand over night in a thermostat at 37½ degrees. It was then filtered and washed with phosphotungstic acid solution. The paper and residue was transferred to a Kjeldahl flask and the nitrogen determined. This fraction was tabulated as true peptone in mgs. nitrogen.

It was attempted to determine the nitrogen in the peptone filtrate, but owing to the concentration of salts digestion was almost impossible. So this small fraction was not determined. The amide nitrogen was also not determined.

Taking a third aliquot of the original solution, the amino acids were estimated by the formaldehyde method, and tabulated in mgs. nitrogen.

As is generally known only comparative results can be obtained by this method. Nitrogen titratable by formaldehyde represents only a minimum of the nitrogen contained in liberated peptides, due to the exist-

	Time	Mgs. Total N	Mgs. Proteos N	Mgs. True Peptone N	Mgs. Amino N
No. 1.					
Straight Grade Flour in	1 Day	4.90	4.20	0.42	0.28
Neutral Solution, using	7 Days	14.42	13.16	1.54	0.56
cresol as antiseptic	11 Days	17.08	13.86	1.82	0.84
	16 Days	17.52	13.58	1.82	1.20
No. 2					
Straight Grade Flour in	1 Day	3.78	3.50	1.26	0.28
Neutral Solution, using	7 Days	4.90	3.78	1.82	0.42
toluol as antiseptic	11 Days	4.90	3.92	1.12	0.42
	16 Days	5.60	2.24	1.26	0.42
No. 3.					
Straight Grade Flour,	1 Day	3.50	1.50	0.72	0.56
solution, cresol and toluol	8 Days	3.92	2.80	0.70	0.28
used for antiseptic	13 Days	3.36	2.24	0.70	0.42
	21 Days	5.74	4.20	0.70	0.42
No. 4.					
Straight Grade Flour in	1 Day	6.72	6.30	1.26	0.28
0.3 per cent HCl solution	7 Days	8.26	6.30	1.12	1.40
using cresol for antiseptic	11 Days	10.08	7.70	2.10	1.96
	16 Days	11.06	5.42	2.52	1.68
No. 5.					
Straight Grade Flour in	1 Day	9.00	4.62	1.00	0.70
0.3 per cent Na Co 3 solu-	7 Days	11.88	9.78	1.40	0.70
tion, using cresol as anti-	11 Days	12.88	12.18	1.68	0.70
septic	17 Days	13.16	11.48	1.26	0.70
No. 6.					
Straight Grade Flour, Plus	1 Day	4.90	3.92	1.54	0.56
0.5 Gram Pepsin 0.3 per cent	10 Days	21.42	2.10	15.26	2.94
HCl cresol	16 Days	21.28	3.22	12.46	2.80
	21 Days	21.20	6.02	12.88	3.64
No. 7.					
Malted Flour, neutral	1 Day	7.00	3.92	2.50	0.56
solution cresol	7 Days	18.34	6.30	3.36	2.94
	11 Days	18.76	3.50	4.20	5.04
	16 Days	19.32	2.10	6.30	7.00
No. 8.					
Clear Flour, neutral	1 Day	5.18	3.72	1.40	0.42
solution using cresol	8 Days	17.78	14.70	1.40	0.98
	15 Days	18.90	12.74	5.60	0.70
	20 Days	19.88	14.84	4.34	2.80

ence of di- and tri-nitrogenous bodies. Sorenson found that with prolin only 85 per cent of the nitrogen could be estimated. However results showing the comparative increase can be obtained by this method.

In this work the aliquot taken was in all cases equal to 1 gram of sample. The straight grade flour contains 19.04 mgs. of nitrogen to the gram. The malted flour contains 22.54 mgs. nitrogen to the gram. The clear flour contains 21.98 mgs. nitrogen to the gram.

We now wish to call your attention to the above table and discuss the data therein.

Our first conclusion is that the breaking down of the protein bodies here shown is due to enzymic action and not to bacteria or to water hydrolysis. We believe that enough antiseptic was added in each case to prevent bacterial action, and we saw no evidence of it.

As to water hydrolysis, please note the data contained in No. 1, No. 2, No. 3. In table No. 1 cresol was used as an antiseptic. In table No. 2, toluol was used as an antiseptic. In table No. 3, both cresol and toluol were used. Had the action been due to hydrolysis, there is no reason why the action in No. 1 should have been more than in No. 2 and No. 3. We see, however, that toluol does inhibit enzymic action. That the breaking down of the protein bodies is not caused by cresol is proven by the data of table No. 3, where the digestion is shown to be about the same as that of table No. 2. This tends to strengthen the evidence that toluol does inhibit enzymic action.

In table No. 1 it is shown that the digestion is steady and increases as the time, with the exception of the peptone, it giving no increase after the eleventh day.

The acid solution, table No. 4, shows a quicker action, but one which does not increase so much with the length of time and does not so nearly reach completion, with the exception of the amino acids, which show no greater amount than that of the neutral solution at the end of the first day, but increase more rapidly and show a greater amount at the end of the sixteenth day.

Table No. 5 shows the results of digestion in alkaline solution. Here again it will be noticed that the action is more rapid, the digestion being very rapid for the first day. After the first day the digestion is not so rapid and in no case does it show the complete digestion at the end of the seventeenth day that those in neutral solution show at the end of the sixteenth day.

In table No. 6 an acid solution was used and pepsin added. The action at the end of the first day compares very closely with that of No. 1 with the exception of the peptone and amino acids. At the end af the tenth day the increase in peptones is very large. The amino acids considerably more than that in the neutral solution at the same period. The amount of proteos being considerably less than that of the neutral solution. From the tenth day on the peptone decreases and the amino acid increases.

The data in table No. 7 shows the action of a sample of malted flour. At the end of the first day you will notice a large increase in soluble nitrogen, peptone nitrogen and amino nitrogen, and the decrease in proteos nitrogen, showing that the malted flour had undergone considerable cleavage before the digestion was started. At the end of the sixteenth day nearly all of the protein is broken down. The amount of amino nitrogen being about twice that of ordinary flour under like conditions.

The data in table No. 8 shows the enzymic hydrolysis on a sample of clear flour.

ACTION OF ENZYMES IN BREAD MAKING

The second part of this paper deals with the effect of enzymes on the quality of bread when added to the flour before fermentation. For this purpose we obtained enzymes in as pure a state as could be obtained, using the products of the Digestive Ferments Co.

The enzymes used were diastase, pepsin, trypsin, pancreatin, steapsin and rennin.

Of these diastase is known to occur in flour. Trypsin or an enzyme closely related is also present in flour. It is not probable that any of the other enzymes used occur in flour.

The enzymes were introduced into the dough batch in the following manner. 0.5 grams of the enzyme was thoroughly mixed with 50 grams of flour. To each of three 500 gram portions of flour was added 2, 5, 10 grams of the 1 per cent mixture of enzyme and the dough mixed in the usual manner.

The loaves made containing diastase were all slightly better than the control loaf. The fermentation was normal throughout. The volume and texture were slightly better than the control loaf.

A slightly softer dough was obtained with the 2 gram portion of pepsin, increasing softness with 5 grams and quite marked softness with the 10 gram portion. The volumes were all under that of the control loaf, decreasing in volume with the proportion of enzyme used.

Trypsin in the 2 gram proportion gave a soft dough. With 5 grams a very soft dough, and with 10 grams the dough was completely broken down and could not be handled. The loaf made from the 2 gram portion was low in volume compared with the control, and that in which 5 grams was used was even worse. The crumb in both loaves was very poor, being wet and weak.

Pancreatin in the 2 gram portion gave a normal loaf. In the 5 gram portion, a loaf of normal volume and poor texture. The 10 gram portion showed decrease in volume and a very poor texture and crumb.

Steapsin, with the 2 gram portion, gave a loaf of low volume with poor texture and crumb. With the 5 gram portion the volume was still further decreased, the texture and crumb ruined. The 10 gram portion became so soft and sticky that it could not be panned. The fermentation was below normal using steapsin in any proportion.

The use of rennin in any of the three proportions had no effect on the fermentation or on the resultant loaf of bread.

All of the above experiments were carried on using our regular baking formulae which includes 10 grams of yeast.

It was decided to use less yeast and less enzyme. A half gram portion of trypsin was used and 7½ grams of yeast. The resultant loaf was normal in volume and texture but a shade off in color.

In all these experiments old flour was used. In some previous work, using new flour, quite an improvement was shown by using a mixture of trypsin and diastase, also by the addition of malted flour.

In this paper we have shown the presence of proteoclastic enzymes in flour and the action of several enzymes during fermentation of the dough and their result on the finished loaf. Our data shows that these enzymes may be greatly stimulated while still in the wheat, in fact, they increase to the extent that bread can no longer be made from the flour. However, when used in small proportions they act beneficially to the baking and especially is this true with flour from a new crop that has not aged.

We have shown that so small an

amount as .02 of one per cent will completely ruin a dough. While the use of .001 of one per cent acts as an improver and shows a saving in yeast.

It may be entirely possible that a slight increase of enzymes is the responsible factor between the difference in baking qualities of old and new wheat flour.

Enzymes occuring in flour may be in such proportions that they do a great deal of harm. On the other hand it is entirely possible that they may be so used to improve the baking qualities of flour.

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Bailey & Gurjar.
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H. E. WEAVER.
J. C. WOOD.

PERSONAL NOTES

Wood, J. C., has left the Larabee Flour Mills Corporation and is now Chief Chemist for the Ladish Milling Co., Milwaukee, Wisconsin.

Harper, O. W., formerly chemist with the Robinson Milling Co., Salina, Kansas, has changed his location to the Atchison Mills Corp., Atchison, Kansas.

Durham, Roy K., is located at the Lexington Roller Mills, Lexington, Kentucky.

Lentz, H. L., recently resigned his position with the United States Bureau of Mines Laboratory at Pittsburgh, Pa., to take charge of the cereal laboratories of the Robinson Milling Co., of Salina, Kansas.

CORRECTION

Correction on the method for Crude Fiber determination in the August Journal, page 6, column 2, line 5, should read, "Add 200 c. c. 3.52 per cent solution of Sodium Hydroxide."

NEW ARTICLES AND ABSTRACTS

Latest revisions of the methods of analyses of the A. O. A. C. are contained in the Association's Journals as follows:

Vol. 1, No. 4, Part 2.
Vol. 2, No. 2, Part 1.
Vol. 2, No. 2, Part 2.
Vol. 2, No. 3, Part 2.

Volumetric Determination of Reducing Sugar.

J. Am. Chem. Soc., Vol. XL, No. 12.

Causes of Deterioration and Spoiling of Corn and Corn Meal.

J. Ind. Eng. Chem., Vol. 12, No. 3.

Following articles listed from the Chemical Abstracts of the American Chemical Society:

Water Content of War Bread. Vol. 14, No. 1.

Milling Value of Flour. Vol. 14, No. 1.
Preventing Molds on Food Products. Vol. 14, No. 1.
Growing and Milling of Corn. Vol. 14, No. 2.
Diastase, Yeast Food. Vol. 14, No. 3.
Leavened Bread. Vol. 14, No. 4.
Yellow Berry in Hard Wheat. Vol. 14, No. 4.
Changes During Baking Bread. Vol. 14, No. 5.
Report on Crude Fiber. Vol. 14, No. 6.
Moisture Content of Cereals. Vol. 14, No. 5.
Superphosphates as Yeast Nutriment. Vol. 14, No. 6.

Laboratory Control of Wheat Flour Milling.

By B. R. Jacobs and O. S. Rask. The Journal of Industrial and Eng. Chem., Vol. 12, No. 9, page 899.

BULLETINS OF INTEREST TO THE CEREAL CHEMIST

The Feeding of Farm Animals. Farmers' Bulletin No. 22, U. S. Dept. of Agriculture.
The Chemical Composition of Wheat. Bulletin No. 111. Washington Agricultural Exp. Station.
Moisture in Wheat and Mill Products. Bulletin No. 788. U. S. Dept. of Agriculture.
The Milling Qualities of Washington Wheats. Popular Bulletin No. 39. Washington Agri. Exp. Station.
Wheat and Flour Investigations, IV. Bulletin No. 102. Washington Agri. Exp. Station.
How to Make Bread From Soft Wheat Flours. Popular Bulletin No. 47. Washington Agri. Exp. Station.
The Application of Dockage in the Marketing of Wheat. Farmers' Bulletin No. 919. U. S. Dept. of Agriculture.
Emmer: A Grain for the Semi-Arid Regions. Farmers' Bulletin No. 139. U. S. Dept. of Agriculture.
Bread Making. Agri. Extn. Bulletin No. 7. No. Dak. Agri. Exp. Station.
Bread and Bread Making. Farmers' Bulyetin No. 389. U. S. Dept. of Agriculture.
The Feed Control Law With Special Advice to Dealers and Distributors of Commercial Feeding Stuffs in Texas. Control Circ. A, Texas Agri. Exp. Station.
Definitions of Feeding Stuffs. Assoc. of Feed Control Officials of the U. S.
Rules and Regulations, Texas Feed Law. Control Circ. C, Texas Agri. Exp. Station.
The Starches of the Grain Sorghums. Bulletin No. 110, Okla. Agri. Exp. Station.
The Grain Sorghums. Bulletin No. 102, Okla. Agri. Exp. Station.
Foods From the Grain Sorghums. Circular No. 27, Okla. Agri. Exp. Station.
Chemical and Physical Constants for Wheat and Mill Products. Bulletin No. 114, No. Dak. Agri. Exp. Station.
The Capacity of Wheat and Mill Products for Moisture. Bulletin No. 120, No. Dak. Agri. Exp. Station.
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Milling and Baking Quality and Chemical Composition of Hard Wheat Flour. Tech. Bulletin No. 1, Kansas Agri. Exp. Station.
Some Nutritive Properties of Corn. Tech. Bulletin No. 95, Kansas Agri. Exp. Station.
Smuts of Grain and Forage Crops in Kansas. Bulletin No. 210, Kansas Agri. Exp. Station.
Milling Tests of Wheat and Baking Tests of Flour. Bulletin No. 177, Kansas Agri. Exp. Station.
Kansas Flour; Chemical Baking and Storage Tests. Bulletin No. 202, Kansas Agri. College.

Report of Cultural and Variety Tests of Wheat. Bulletin No. 121, Arkansas Agri. Exp. Station.

Rules and Regulations: Commercial Feed Stuffs. Bulletin No. 60A, So. Carolina Agri. Exp. Station.

Red Rock Wheat. Circular No. 31, Michigan Agri. Exp. Station.

Commercial Feeding Stuffs. Bulletin No. 77, Georgia Agri. Exp. Station.

Bulletin No. 106, No. Dak. Exp. Station.

A Study of Colorado Wheats. Bulletin No. 247, Colo. Agri. Exp. Station.

The Wheat Joint Worm. Bulletin No. 226, Ohio Agri. Exp. Station.

Michigan Weeds. Bulletin No. 267. Michigan Agri. Exp. Station.

BOOKS OF INTEREST TO THE CEREAL CHEMIST

Commercial Organic Analysis, Allen. Vols. I and VIII. P. Blakistons' Son & Company.

The Chemistry of Breadmaking, James Grant. Edward Arnold, London.

Bacteriology and Mycology of Foods, F. W. Tanner. John Wiley & Sons.

General Chemistry of the Enzymes, Hans Euler. John Wiley & Sons.

Food Inspection and Analysis, Albert E. Leach. John Wiley & Sons.

Creative Chemistry, Edrain E. Slosson. Century Co., New York.

Practical Organic and Bio-Chemistry, by R. H. A. Plimmer. Longmans, Green & Co., New York City.

The Chemical Constitution of the Proteins. By the same author. Part I and II. Longmans, Green & Co., New York City.

The Vegetable Proteins, by Thomas B. Osborne, Ph. D. Longmans, Green & Co., New York City.

The Nature of Enzyme Action, by W. M. Bayliss. Longmans, Green & Co., New York City.

Biochemical Catalysts in Life and Industry, by Jean Effront. John Wiley & Sons, Inc., New York City.

Enzymes and Their Applications, by Jean Effront. John Wiley & Sons, Inc,. New York City.

Chemistry of Colloids, by Richard Zsigmondy, Ellwood B. Spear. John Wiley & Sons, Inc., New York City.

Elementary Chemical Microscopy, by Emile M. Chamot. John Wiley & Sons, Inc.. New York City.

Principles of Physical Chemistry, by Edward W. Washburn. McGraw-Hill Book Co., New York City.

The Technology of Breadmaking, by William Jago and William C. Jago. Bakers Helper Company, Chicago.

Standard Methods of Chemical Analysis. Edited by Winifred W. Scott. D. Van Nostrand Co., 25 Park Ave., New York.

General Bacteriology, by Edwin O. Jordan. W B.. Saunders Co., Philadelphia.

Bacteriological Technique, by J. W. H. Eyre. W. B. Saunders Co., Philadelphia.

The Chemistry of India Rubber, by Carl Otto Weber. Charles Griffin and Company, Limited, London.

Manual of Industrial Chemistry. Edited by Allen Rogers. D. Van Nostrand Company, 25 Park Place, New York.

A METHOD FOR DRYING GLUTEN

The writer has tried different methods for the determination of gluten and finds the following method to be the most satisfactory:

After the usual washing of the gluten spread it out equally over a tin plate 3x4 inches and dry in a vacuum at a temperature of 85° C. for 45 minutes (25″ vacuum). The writer used a Mojoinnier Bros. Co. Vacuum Oven and pump, and the resulting dry gluten was the most thoroughly dry and ideal looking gluten ever obtained.

M. E. SCHULTZ,
The Weber Flour Mills Corporation,
Salina, Kansas.

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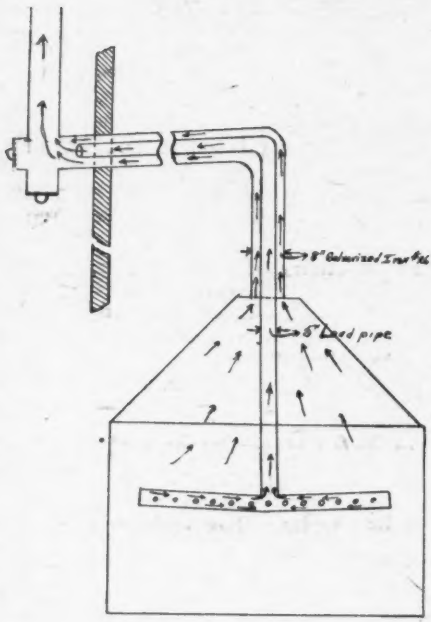
PRACTICAL HOOD DESIGN



The plan of the gas hood is self-explanatory to a large extent. The chief feature of the design is the double draft which has been found to eliminate all gas fumes entirely. By having the extra draft on the main part of the hood all of the fumes that escape the lead pipe are removed and do not escape into the room. The extra draft also sets up an air current that helps the proper working of the draft of the fume pipe.

The inner pipe is the one that receives the larger portion of the acid fumes and by making this one of lead the corrosion by the fumes can be reduced to a minimum. The outer pipe can be made of heavy galvanized sheet iron as this is a little cheaper when long lengths of pipe are required. For short lengths the difference in the cost of lead pipe and galvanized iron will not warrant the use of the galvanized iron.

The horizontal pipe used to lead the gases out through the wall of the building is given a slight downward slope to eliminate the return of dirt to the hood. Most of the condensation of gases will take place in the upright pipe unless this is very short and the condensed liquids are removed through a small hole in the bottom of upright lead pipe.

On the outside of the wall are placed two removable fittings in the larger pipe. The pipes are cleaned through these holes, one being placed in the vertical and the other in the horizontal pipes. This feature will have to be made to meet requirements, as it may be unhandy to clean pipes if the are above the first story.

Design would have to be changed to meet the conditions peculiar to each laboratory, but the efficiency of the hood would not be reduced as long as the double draft was retained and there being sufficient draft for the setting up of a good current of air. Dimensions are not given except in the case of the two pipes, as these would have to be materially altered to meet the requirements of the building and laboratory.

S. J. LAWELLIN.

A. A. Jones has completed the change of all gas equipment in his laboratory to electric. The Gilmer electric heaters installed are proving quite successful in nitrogen digestion and distillation.

"Control of Insect Pests" which infest flour and cereal mills is the title of a new bulletin which is of interest. It is Bulletin No. 872, Bureau of Entomology, U. S. D. A.

OFFICIAL METHODS OF ANALYSIS OF THE AMERICAN ASSOCIATION OF CEREAL CHEMISTS

Report all results on 13.5 per cent moisture basis.

MOISTURE (Flour, Feed. etc.)

Material to be ground as fine as possible. Weigh as quickly as possible a five (5) gram portion of the sample into a tared, low form, flat bottomed dish provided with a cover; place in a drying oven at 101 to 105 degrees centigrade and dry to constant weight. (This usually requires 5-6 hours.) The loss in weight is calculated to per cent moisture.

ASH (Flour, Feed, etc.)

Weight from 3 to 5 grams of sample into tared crucible and ignite in muffle furnace at low red heat until the ash becomes white or gray-white and free from carbon. Avoid fusing the ash. Cool in a desiccator and weigh. Calculate to per cent ash.

PROTEIN (Flour, Feed, etc.)

Place 1 gram of sample into digestion flask and determine the nitrogen by either of the following methods:

(a) Kjeldahl—

Approximately 0.7 grams of mercuric oxide, or its equivalent in metallic mercury is added and 20-30 cc. of sulphuric acid, (Sp. Gr. 1.84). Place the flask in inclined position and heat at low heat until the frothing ceaces then increase heat until the acid boils briskly and digest for a time after the mixture becomes colorless, or until oxidation is complete. Cool. Dilute with about 200 cc. of tap water, add a few pieces of pumice or other material to prevent bumping and add 25 cc. of potassium sulphid solution with shaking. Next add sufficient sodium hydroxid solution to make the reaction strongly alkaline. Pour this solution down the side of the flask without mixing until the flask is connected for distillation; then shake. Distil until all the ammonia has passed over into a measured quantity of standard acid. The first 150 cc. of distillate generally contains all the ammonia. Titrate with standard alkali, using sodium alizarin sulphonate as indicated.

(b) Kjeldahl Gunning method.

Add approximately 10 grams of powdered anhydrous sodium sulphate or 10 grams of powdered potassium sulphate, and 15 cc. to 25 cc. of sulphuric acid (0.1 to 0.3 grams of copper sulphate, or its equivalent in metallic copper, may also be added). Conduct the digestion as described above. Complete the determination as in (a) except that no potassium sulphid is added.

(c) Kjeldahl Gunning Arnold method.

Add about 15 grams of potassium sulphate, or 15 grams of anhydrous sodium sulphate, 1 gram copper sulphate, 1 gram of mercuric oxid or its equivalent in metallic mercury and 25 cc. of sulphuric acid. Digest until oxidation is complete. Cool, dilute with about 200 cc. of water, add 50 cc. of potassium sulphid solution, make strongly alkaline with sodium hydroxid solution and complete the determination as in (a).

Calculate the per cent protein by the factor Nx5.7.

Reagents required:

1. Standard sulphuric acid N/10.
2. Standard Sodium hydroxid N/10.
3. Sulphuric acid, Sp. Gr. 1.84, free from nitrate and ammonium sulphate.
4. Metallic mercury, or mercuric oxid—Mercuric oxid should be free of nitrates.
5. Copper, or copper sulphate.
6. Granulated zinc or pumice stone—added to prevent bumping.
7. Potassium sulphid solution—Dissolve 40 grams of commercial potassium sulphid in 1 liter of water.

8. Sodium hydroxid solution—Saturated solution commercial hydroxid free from nitrates.

9. Sodium alizarin sulphonate—1 gram to 1 liter of neutral distilled water.

Note:—A few drops of phenolphthalein indicator added to solution before making alkaline with sodium hydroxid will indicate alkalinity before distilling. The pink color of this indicator is destroyed by excess of strong fixed alkali.

PROTEIN (Wheat).

The nitrogen is determined by either (a), (b) or (c) and the per cent protein calculated by factor Nx5.7.

PROTEIN (Feed).

The nitrogen is determined by either (a), (b) or (c) and the per cent protein calculated by factor Nx6.25.

CRUDE FIBER.

Weigh out about two grams of finely ground sample. Dry. Extract the fat. Transfer to an 800 cc. vessel having a reflux condenser and add 200 cc. of boiling 1.25 per cent sulfuric acid. Boil for thirty minutes and then add 200 cc. of boiling 3.52 per cent sodium hydroxide solution and boil for thirty minutes more. Remove from the heat. Make the solution slightly acid and filter into an alundum or gooch crucible having a well made mat of ignited asbestos. Wash until free from acid and then wash once with alcohol and once with ether. Place in the drying oven and dry to constant weight. Cool and weigh. Incinerate in a muffle furnace to a carbon free ash, then cool in a desiccator and weigh. The loss in weight is calculated to per cent crude fiber.

ACIDITY.

Ten grams of sample are shaken thoroughly with 250 cc. of distilled water free from carbon dioxide. Digest for two hours at 40 degrees C., shaking every fifteen minutes. Centrifuge and filter on a dry filter. Use a fifty cc. aliquot of the filtrate and titrate with twentieth normal alkali using 2 cc. of carefully neutralized phenolphthalein indicator. Each cc. of N/20 alkali will be equivalent to .0045 grams of lactic acid. Calculate to per cent acidity ac lactic acid.

TENTATIVE METHODS OF ANALYSIS OF THE AMERICAN ASSOCIATION OF CEREAL CHEMISTS

ALCOHOL-SOLUBLE PROTEINS. (Gliadin.)

Transfer four grams of the flour to a 150-200 cc. bottle or Erlenmeyer flask and add 100 cc. of 70 per cent alcohol by volume, taking care that none of the material sticks to the bottom of the container. Shake thoroughly 10-12 times at intervals of 30 minutes at room temperature or shake continuously in a shaking machine for an hour and then set aside over night. Shake thoroughly once more and then filter through a dry, folded filter, returning the first runnings to the filter until a clear filtrate is obtained; or centrifuge for ten minutes or until solution is clear and proceed as follows: Pipette 50 cc. of the filtrate, equivalent to 2 grams of the sample, into a Kjeldahl flask, dilute with 100 cc. of water to prevent frothing during digestion and determine nitrogen as under protein. Calculate protein by factor Nx5.7 and report as per cent Gliadin.

PROTEINS SOLUBLE IN 5 PER CENT POTASSIUM SULPATE SOLUTION.

Weigh 6 grams of the flour into a 200 cc. flask and introduce exactly 100 cc. of 5 per cent potassium sulphate solution. Shake at 30 minute

intervals for three hours, or, better, agitate at moderate speed in a shaker for one hour, let settle 30 minutes, filter and determine the nitrogen in 50 cc. of the filtrate as directed under protein. Calculate per cent protein by factor Nx5.7 and report as salt soluble protein.

GLUTENIN.

Deduct the sum of the potassium sulphate-soluble protein and the alcohol-soluble protein from the total protein and report as per cent Glutenin.

COLD WATER SOLUBLE EXTRACT.

Weigh 20 grams of the flour into a 500 cc. Erlenmeyer flask and add gradually 200 cc. of water at a temperature not higher than 10 degrees C., shake vigorously when about 50 cc. of water have been added and continue shaking during the addition of the remainder. Allow to stand at 10 degrees C. for 40 minutes, shaking occasionally. Filter through a large, dry, coarse filter paper, returning the first runnings to the filter until a clear filtrate is obtained. Pipette 20 cc. of the clear filtrate into a tared dish, exaporate to dryness on a steam bath and dry in an oven at 100 degrees C. for periods of thirty minutes to constant weight, or determine specific gravity by the use of picnometer.

PENTOSANS METHOD OF A. O. A. C. AS FOLLOWS:

Place a quantity of the material, 2-5 grams, chosen so that the weight of phlorogluceid obtained shall not exceed 0.300 gram, in a 300 cc. distillation flask, together with 100 cc. of 12 per cent hydrochloric acid (sp. gr. 1.06) and several pieces of recently heated pumice stone. Place the flask on a wire gauze, connect with a condenser, and heat, rather gently at first, and regulate so as to distill over 30 cc. in about 10 minutes, the distillate passing through a small filter paper. Replace the 30 cc. distilled by a like quantity of the dilute acid, added by means of a separatory funnel in such a manner as to wash down the particles adhering to the sides of the flask, and continue the process until the distillate amounts to 360 cc. To the total distillate add gradually a quantity of phloroglucin dissolved in 12 per cent hydrochloric acid and stir thoroughly the resulting mixture. The amount of phloroglucin used should be about double that of the furfural expected. The solution turns first yellow, then green, and very soon an amorphous grenish precipitate appears, which grows darker rapidly until it becomes finally almost black. Make the solution up to 400 cc. with 12 per cent hydrochloric acid and allow to stand over night.

Filter the amorphous black precipitate in a tarred Gooch crrucible having an asbestos mat, wash carefully with 150 cc. of water in such a way that the water is not entirely removed from the crucible until the very last, then dry for 4 hours at the temperature of boiling water, cool and weigh in a weighing bottle, the increase in weight being reckoned as furfural phlorogluceid. To calculate the pentosan from the phlorogluceid, use the following formulas given by Krober:

(1.) For a weight of phlorogluceid, designated bw "a" in the following formula, under 0.03 grams .

Pentosans—(a plus 0.0052) x 0.8949.

In the above and also in the following formulas, the factor 0.0052 represents the weight of phlorogluceid which remains dissolved in the 400 cc. of acid solution.

(2.) For a weight of phlorogluceid "a" between 0.03 and 0.300 gram, use Krober's table XXX Table 2, or the following formula:

Pentosans—(a plus 0.0052) x 0.8866.

(3.) For a weight of phlorogluceid "a" over 0.300 gram.

The Safety Valve

This is your Journal. If it is to be a success it must receive the loyal support of *all* the members. Since the present editor has been in office he has received but very few papers or original articles. Two or three members have been the only ones to contribute. Surely out of our entire membership there must be more than *that* who could contribute something of value to our publication. It is up to you, the members, to MAKE this publication. There surely is some thing of mutual interest that you could write that would be of untold value to all the rest of us. WRITE IT UP. It is too bad that the editor must write such a note as this to you. We should HAVE to enlarge our Journal. TAKE AN INTEREST. It is YOUR publication. It is YOUR advertiser. It is your reflection, if you please. Let it be a true reflection of your interest in your work. We must work together. *Let us have a little team work.* Let us receive an article or original paper from every member. Also let us receive contributions from non-members that are interested in our work and organization. We have a contribution from one non-member in this issue. WAKE UP. Show the readers of this Journal that you are alive and progressive and interested in your chosen work. *Get ahead.* Let everyone know how interested you are in your work. GET BUSY.

Pentosans—(a plus 0.0052) x 0.8824.

ETHER EXTRACT, OR CRUDE FAT.

(Feed, Flour, etc.)

Dry 2-5 gram sample of material and transfer to extraction thimble. Flour or very fine material should be mixed with clean fat free sand. Extract for 16 hours with fat free sulphuric ether. Determine per cent fat either by loss or by weighing fat collected.

BREAD FORMULA.

400 grams Flour,
12 grams Sugar,
12 grams Yeast,
8 grams Salt,
10 grams Shortening,
240 grams Water (according to absorption.)

Keep temperature proofing box at 80-86 degrees F. Let raise two and a half hours to first punch; one hour to second; one hour to the pan; 30-60 minute proof.

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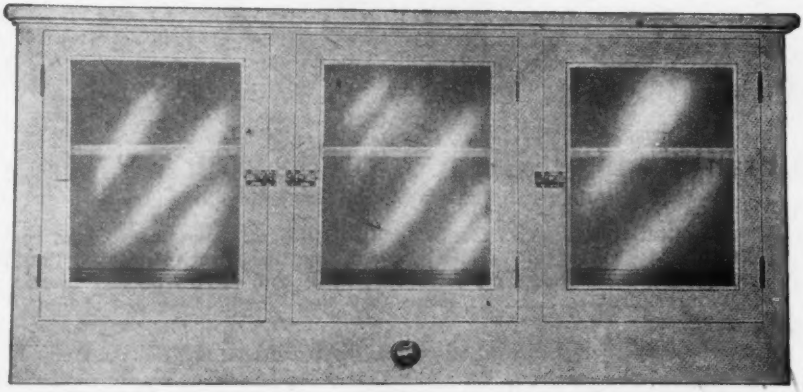

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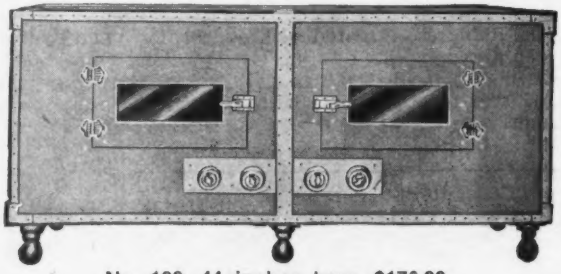

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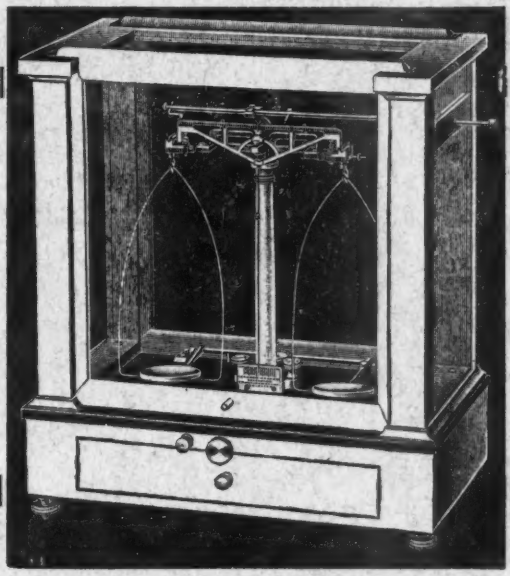

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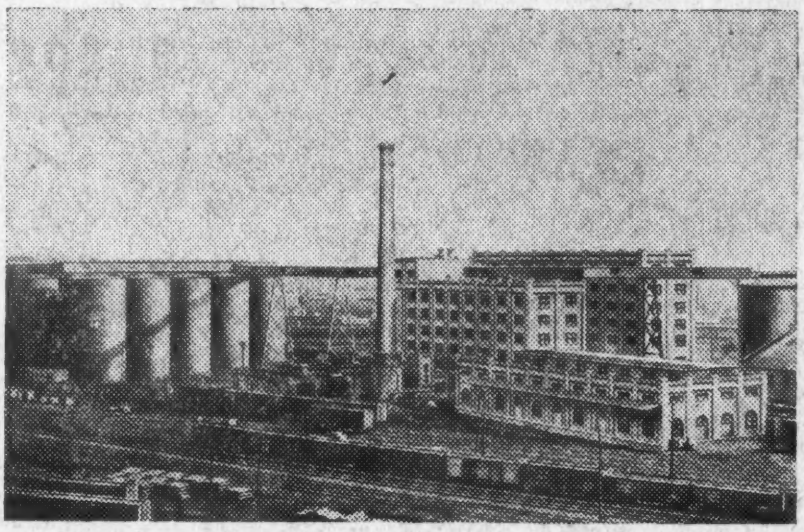

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